DESCRIPTION

CUTTER UNIT OF STAPLER

[0001] This application is the national stage of International Application No. PCT/JP2004/015402 filed on October 19, 2004, and thus claims the benefit of this filing date under 35 U.S.C. 371(c). This application further claims priority under 35. U.S.C. 119(a) and 365(b) to Japanese Patent Application No. P.2003-359916 filed on October 20, 2003, and Japanese Patent Application No. P.2003-359917 filed on October 20, 2003, the priority of which was also claimed in the international stage of International Application No. PCT/JP2004/015402.

Technical Field:

[0002] The present invention relates to a stapler for striking out a C-shaped staple into a stack of sheets and bending the staple legs after they have penetrated to a back side of the stack of sheets being stapled. In particular, the present invention relates to a cutter unit for cutting the legs of a staple at the back side of a stack of sheets being stapled depending on the thickness of the stack.

[0003] Further, the invention relates to a processing apparatus for processing the portions of a staple leg cut off by the cutter unit.

Background Art:

[0004] Staples for binding stacks of sheets come in a variety of leg lengths corresponding to the thickness of the stack of sheets to be stapled to be stapled, and those staples of varying leg lengths must be loaded into a stapler. However, when the thickness of the stack of sheets to be stapled is frequently changed, a staple corresponding to the stack thickness is not changed for each stack. Therefore, staples with a staple leg length corresponding to the maximum thickness which can be stapled are loaded into the stapler. This results in a situation in which stapling a thinner stack of sheets leaves a longer than desired staple leg to be bent by the clincher mechanism. If the leg length is too long for the thickness of the stack, the free ends of the staple legs may penetrate the stack of sheets and project out of the front surface of the stack.

[0005] In a stapler installed in a copier for binding stacks of sheets, there is proposed a stapler having a cutter unit for cutting the front end portions of staple legs such that a length of the staple legs projected out of the back of a stack of sheets being stapled becomes substantially constant in order to prevent the staple leg from being projected to the front side of a stack of sheets thinner than the maximum that can be stapled.. (For example, JP-B-02-021922.) The cutter unit comprises a movable clincher for bending the staple leg on the back side of the stack of sheets being stapled and a fixed cutter arranged to be opposed to the movable clincher. The front end portions of the staple legs are cut by a movable cutter edge formed at the movable clincher and a fixed cutter edge of the fixed cutter, and the front ends of the staple are cut along with the bending of the staple legs by the movable clincher.

[0006] Further, there is also proposed a cutter unit provided with a movable cutting member movable in a direction substantially orthogonal to a direction of penetrating staple legs and formed with a first cutter edges engaged with staple legs on a lower side of a movable clincher for engaging the staple legs on the back side of a stack of sheets to be stapled, and a fixed cutting member for guiding movement of the movable cutting members is formed with second cutter edges formed at the fixed cutting members for cutting the staple leg in cooperation with the first cutter edge of the movable cutting member. (For example, JP-Y-03-025930.) According to the cutter unit, a front end portion of the staple leg is cut by engaging the staple legs with the first and the second cutter edges formed at the respective movable and fixed cutting members and moving the movable cutting member along the fixed cutting member. Thereafter, the staple leg is bent along the back side of the stack of sheets being stapled by the movable clincher mechanism.

[0007] In the first of the above-described movable clinchers, each member of a pair of the movable clinchers is pivotably supported in the axial direction. In order to cut the staple leg between the movable cutter edge and the fixed cutter edge, a high dimensional accuracy is required for setting a clearance between the movable and fixed cutter edges. Thus, greater accuracy is required in part dimensions, working, and integrating the parts, increasing part cost or product cost. Further, there is an increased operational hazard of failure in cutting and a failure in clinching by wear. Further, burrs formed at an end face of staple legs by cutting are on

an outer side of the staple legs and therefore, there is a concern of being injured by being brought into contact with the staple within the stapled stack of sheets.

[0008] Further, according to the second item of background art described above in which the movable cutting member is provided on the lower side of the movable clincher, and the staple leg is cut between the movable cutting member and the fixed cutting member by moving the movable cutting member in the direction substantially orthogonal to the direction of the staple leg, the movable clincher and the movable cutting member need to be arranged on the same plane and therefore, a length of a portion of the movable clincher engaged with the staple leg is limited. This results in a problem clinching the staple legs into a stable shape. Further, burrs formed in cutting the staple legs are located on a side face of the staple and therefore, there is a concern of being injured by being brought into contact with the staple within the stapled stack of sheets.

[0009] Further, according to the stapler having the above-described cutter unit, there may be a problem of staple chips cut by the cutter unit being scattered inside of the stapler such that they can be pinched by an operating mechanism of a drive gear, a link or the like to bring about an operational hazard, or dropped onto a circuit board to cause short circuits.

[0010] In order to prevent the hazard of scattered staple chips, according to the stapler having the cutter unit for cutting a front end portion of the staple leg, there may be provided a staple chip processing apparatus for preventing the staple chips from being scattered and instead accumulating the staple chips at a predetermined place. For example, according to a staple chip processing apparatus of a staple leg described in JP-Y-03-025931, a chute is inclined at a staple chip discharging portion of the cutter unit, a closing member operated to close a lower end opening portion of the chute by the gravitational force is axially attached at the lower end opening portion of the chute.

[0011] According to a stapler installed at a transfer path of a sheet inside a copier or the like for stapling stacks of sheets, the sheets may be bound in a horizontal state or a vertical state. Therefore, it is preferable to be able to install the stapler in either a horizontal or vertical direction. However, according to the above-described cutting chip processing apparatus of the staple leg, the chute mounted to the cutting chip discharging portion of the cutter unit is mounted

to a front side of the stapler and the lower end opening portion of the chute is closed by the gravitational force operation. Therefore, for example, when the stapler is installed to bind sheets to be bound substantially in a vertical state, the cutting chip is not discharged into the chute. Further, the lower end opening portion is not opened or closed and therefore, the stapler cannot be installed to direct in a number of directions and the stapler needs to be redesigned.

[0012] Patent Reference 1: JP-B-02-021922

[0013] Patent Reference 2: JP-Y-03-025930

Disclosure of the Invention

[0014] It is an object of the invention to resolve the above-described drawback and it is a first object thereof to provide a stapler capable of providing a staple clinch shape by a movable clincher and having a cutter unit in which there is not a concern of being injured by a burr formed at a front end face of a staple leg after having been cut.

[0015] Further, it is a second object of the invention to provide a stapler having a staple chip processing apparatus capable of being installed in any direction to allow a sheet to be bound in a horizontal state or a vertical state and firmly guiding a cutting chip to a chip containing portion.

[0016] In order to achieve the first object, a stapler according to the invention is characterized by its ability to bend a staple leg of a staple inserted into a stack of sheets being stapled by a striking mechanism portion and along a back side of the stack of sheets being stapled by pivoting a pair of movable clinchers from a standby position to an operating position. The stapler is provided with a cutter unit comprising a fixed cutter arranged between a pair of the staple legs and a pair of movable cutters formed with cutter edges operated from outer sides to inner sides of the staple legs relative to the fixed cutter. The cutter unit is arranged slidably between a position advanced into an operation region of the movable clincher opposed to a staple strike out portion of the striking mechanism and a position removed from the operation region of the movable clincher. The cutter unit is advanced to the operation region of the movable clincher pivoted to the standby position to cut the staple leg inserted into the stack of sheets being stapled. After removing the cutter unit from the operation region of the movable clincher, the movable clincher is pivoted to the operating position to bend the cut staple legs.

[0017] According to the invention, the front end portion of the staple legs are cut by arranging the fixed cutter between the staple legs and operating the movable cutter from the outer side to the inner side of the staple legs. Therefore, in a state of binding the staple, a burr formed at a cutting face of the staple leg is formed on an inner side of the staple leg, that is, to a side of a face of the sheet to be bound. The stack of sheets is bound in a state in which the burr at a front end face of the staple leg is brought into close contact with the back side of the stack of sheets being stapled. Even when the hand is brought into contact with the staple leg, the hand is not brought into contact with the burr and there is not a concern of being injured by the burr produced by cutting the staple leg.

[0018] Further, the cutter unit is arranged movably between a position opposed to the staple strike out portion constituting the operation region to pivot the movable clincher and a position removed from the operation region to pivot the movable clincher. In a state of advancing the cutter unit between the movable clinchers pivoted to the standby positions, the staple legs inserted into the stack of sheets being stapled are cut by the cutter unit. After removing the cutter unit from the operation region of the movable clincher, the staple leg cut by the movable clincher is bent and therefore, a greater length of the portion of the movable clincher engaged with the staple leg is possible, and an excellent binding shape can be provided by engaging the movable clincher with a front end portion of the staple leg.

[0019] Further, in order to achieve the second object, a staple leg chip processing apparatus of a stapler according to the invention comprises a striking mechanism portion for striking out a staple to a stack of sheets being stapled, a clincher mechanism portion supported to be able to be operated proximate to and remote from the striking mechanism portion for bending a staple leg inserted into a stack of sheets being stapled along a back face of the stack of sheets being stapled, and a cutter unit formed inside of the clincher mechanism portion for cutting the staple leg projected to a side of a back face of the stack of sheets being stapled. The cutter unit is constituted by a fixed cutter member and a movable cutter pivotably supported by the fixed cutter member. The cutter unit is provided slidably between a staple strike out position for striking out the staple from the striking mechanism portion and a removed position on a rear side of the clincher mechanism. The cutter unit is moved to the removed position on the rear side after advancing to the staple strike out position and cutting the staple leg. At the removed

position, chips of cut staples ("staple chips") are discharged to a side of a lower face of the cutter unit by way of an opening formed at the cutter unit, and guided into a chip containing portion by way of a chute arranged on the side of the lower face of the cutter unit.

[0020] Further, one end of the chute may be supported pivotably by a side of a lower face of a support base slidably supporting the cutter unit, while the other end of the chute may be arranged in a chip containing portion, and a side of a pivotably supporting portion of the chute may be moved to an upper side such that an inclination angle of the chute is increased by pivoting the clincher mechanism portion.

[0021] According to the invention, the staple chips are discharged to the chute formed on the side of the lower face of the cutter unit by way of the opening formed at the cutter unit, guided into the chip containing portion by way of the chute and are stored in the chip containing portion. This prevents staple chips' getting into a drive mechanism or the like or a clearance within the stapler to bring about an operational hazard in the drive mechanism. Further, the cutter unit for cutting the staple legs is arranged to be able to move between a staple strike out position and a removed position on a rear side of the clincher portion. The staple chips are discharged to a side of the lower face of the support base by way of openings formed at the cutter unit and the support base and therefore, even when a stapler main body is installed to staple a stack of sheets in the horizontal direction and the vertical direction, the staple chips can be guided into the chip containing portion by way of the chute and the stapler can be included in various kinds of copiers or other office equipment to staple a stack of sheets in the horizontal direction and the vertical direction.

[0022] Further, the one end of the chute is supported pivotably by the side of the lower face of the support base slidably supporting the cutter unit. The other end of the chute is arranged in the chip containing portion. The staple chips are discharged into the chip containing portion by pivoting the chute to thereby increase the inclination angle of the chute by pivoting the clincher mechanism portion and therefore, the staple chips can be discharged into the chip containing portion and the staple chips stay in the chute instead of being scattered into the stapler main body.

Brief Description of the Drawings:

[0023] Fig. 1 is a side view of a stapler having a cutter unit according to a first embodiment of the invention.

[0024] Fig. 2 is a side view of the stapler of Fig. 1 in a state of operating a clincher mechanism portion.

[0025] Fig. 3 is a front view of a clincher mechanism portion in a state of operating a movable clincher to a standby position.

[0026] Fig. 4 is a perspective view of the clincher mechanism portion of Fig. 3.

[0027] Fig. 5 is a front view of the clincher mechanism portion of Fig. 3 in a state of pivoting the movable clincher to an operating position.

[0028] Fig. 6 is a perspective view of the clincher mechanism portion of Fig. 5.

[0029] Fig. 7 is a plan view of a staple leg cutting mechanism in a state of being able to receive the staple leg between a fixed cutter and a movable cutter.

[0030] Fig. 8 is a plan view of the staple leg cutting mechanism in a state of cutting the staple leg by pivoting the movable cutter.

[0031] Fig. 9 is a side view of the cutter unit of Fig. 7 advanced to a staple strike out portion.

[0032] Fig. 10 is a perspective view of the cutter unit of Fig. 8.

[0033] Fig. 11 is a side view of the cutter unit operated to removed position from the staple strike out portion.

[0034] Fig. 12 is a perspective view of the cutter unit of Fig. 10.

[0035] Fig. 13 is a perspective view of the cutter unit of Fig. 7 in a state of cutting a staple.

[0036] Fig. 14 is a side view of a stapler embodying a staple chip processing apparatus according to a second embodiment of the invention.

[0037] Fig. 15 is a side view of the stapler of Fig. 14 in a state of operating a clincher mechanism portion.

[0038] Fig. 16 is a perspective view of a clincher mechanism portion in a state of operating a movable clincher to a standby position.

[0039] Fig. 17 is a perspective view of the clincher mechanism portion of Fig. 16 in a state of pivoting the movable clincher to an operating position.

[0040] Fig. 18 is a perspective view showing a cutter unit in a state of being arranged at a staple strike out portion.

[0041] Fig. 19 is a perspective view showing the cutter unit of Fig. 18 in a state of being operated to a removed position on a rear side.

[0042] Fig. 20 is a sectional view of the stapler of Fig. 14 cut in a vertical direction along a center line of a chute.

[0043] Fig. 21 is a plan view of the cutter unit of Fig. 18 in a state of cutting a staple leg.

[0044] Fig. 22 is a sectional view of the cutter unit of Fig. 18 taken along a line A-A of Fig. 21.

[0045] Fig. 23 is a plane view showing the cutter unit of Fig. 18 in a state of being operated to the removed position on the rear side.

[0046] Fig. 24 is a sectional view of the cutter unit of Fig. 18 taken along a line B-B of Fig. 23.

[0047] Further, in notations in the drawings, numeral 1 designates a stapler, numeral 3 designates a striking mechanism portion, numeral 4 designates a clincher mechanism portion, numeral 5 designates a movable clincher, numeral 10 designates a staple leg cutting mechanism (cutter unit), numeral 11 designates a fixed cutter, numeral 13 designates a movable cutter, numeral 14 designates a cutter edge, and numeral 15 designates a cutter edge.

[0048] Further, numeral 101 designates a stapler, numeral 103 designates a stapler striking mechanism portion, numeral 104 designates a clincher mechanism portion, numeral 110 designates a cutter unit, numeral 111 designates a fixed cutter member, numeral 114 designates a movable cutter, numeral 116 designates a support base, numeral 120 designates a staple chip processing apparatus, numeral 121 designates an opening, numeral 122 designates an opening, numeral 123 designates a staple chip containing portion, and numeral 124 designates a chute.

Best Mode for Carrying out the Invention:

[0049] <First exemplary embodiment>

[0050] Fig. 1 is a stapler embodying a cutter unit according to a first embodiment of the invention. Machine frame 2 forms an outer contour of the stapler 1 housing an electric motor and a drive mechanism driven by the electric motor. A lower portion of the machine frame 2 is formed with a striking mechanism portion 3 driven by the drive mechanism for striking out a staple formed in a C-shape into a stack of sheets being stapled. The striking mechanism portion 3 of the stapler 1 according to the embodiment is constituted to form a number of staple members in a straight shape connected with each other into the staples in the C-shape by forming means and striking out the formed staples upwardly into a stack of sheets being stapled arranged on an upper side of the striking mechanism portion 3 by strike out means. Further, an upper portion of the machine frame 2 opposed to the striking mechanism portion 3 is formed with the clincher mechanism portion 4 for bending the staple legs inserted into an upper side of the stack of sheets being stapled along an upper face of the stack of sheets being stapled.

[0051] The clincher mechanism portion 4 is supported by the machine frame 2 pivotably in directions in which a front end portion thereof is proximate to and remote from the striking mechanism portion 3, and is operated to pinch the sheets to be bound between the striking mechanism portion 3 and the clincher mechanism portion 4 by operating the clincher mechanism portion 4 in the direction of the striking mechanism portion 3 as shown by Fig. 2 after the sheets to be bound are arranged between the striking mechanism portion 3 and the clincher mechanism portion 4. As shown by Fig. 3 and Fig. 4, the clincher mechanism portion 4 is provided with a pair of the movable clinchers 5 for engaging the legs of the staple protruding from the upper side of the stack of sheets being stapled and bending the staple legs along the upper side of the stack

of sheets being stapled pivotably relative to a support plate 7 on pivoting shafts 6. In a state of pivoting the movable clincher 5 to a standby position as shown by Fig. 3 and Fig. 4, by striking out the staple S from the striking mechanism portion 3 into the stack of sheets being stapled and driving to pivot the movable clincher 5 from the standby position to the operating position centering on the pivoting shafts 6 as shown by Fig. 5 and Fig. 6, the staple leg S1 inserted into the stack of sheets being stapled is bent along the upper side of the stack of sheets being stapled. Further, after stapling the stack of sheets being stapled, the clincher mechanism portion 4 is operated again in the direction of being remote from the striking mechanism portion 3 to be operated to an initial position shown in Fig. 1.

[0052] The staple S1 struck out from the striking mechanism portion 3 to penetrate the stack of sheets being stapled arranged on the upper side of the striking mechanism portion 3 is engaged with the movable clincher 5 and bent along the face of the stack of sheets being stapled, whereas a length of the staple leg S1 formed in the C-shape is a constant length, the number of sheets in the stack of sheets to be stapled varies and therefore, a projected length of the staple leg S inserted to the back side of the stack of sheets being stapled varies in accordance with the thickness of the stack of sheets being stapled. The clincher mechanism portion 4 is formed with the cutter unit 10 for cutting the staple leg S1 inserted into the stack of sheets being stapled to an appropriate length in order to make constant the projected length of the staple leg S1 inserted into the stack of sheets being stapled.

[0053] As shown by Fig. 7, the cutter unit 10 is formed by the fixed cutter 11 arranged between the pair of staple legs S1 protruding from the upper side of the stack of sheets being stapled by penetrating the stack of sheets being stapled, and a pair of movable cutters 13 pivotably supported centering on the pivoting shafts 12 in a state of being brought into close contact with the upper face of the fixed cutter 11. With regard to the staple leg S1 arranged between the fixed cutter 11 and the movable cutter 13, as shown by Fig. 8, the cutter edges 14 of the movable cutters 13 centering on the pivoting shafts 12 of the movable cutters 13 pivot from the outer sides of the staple legs in directions of inner sides thereof. Front end portions of the staple legs S1 are cut by a predetermined length between the cutting edges 15 on both sides of the fixed cutter 11 and the cutter edges 14 of the movable cutters 13. By cutting the front end portion of the staple leg S1 by operating the cutter edge 14 of the movable cutter 13 from the

outer side to the inner side of the staple leg S1 in this way, burrs formed at a cut end face of the staple leg S1 are formed on the inner side of the staple leg S1, that is, to the side of the stack of sheets being stapled, and the burr is arranged in a direction of being brought into close contact with the stack of sheets being stapled.

[0054] The movable clincher 5, a part of clincher mechanism portion 4, is for bending the staple leg S1 along the back side of the stack of sheets being stapled and is formed at a position opposed to a staple strike out portion for striking out the staple from the striking mechanism portion 3. An operation region of the movable clincher 5 opposed to the staple strike out portion of the striking mechanism portion 3 is arranged with the cutter unit 10 constituted by the fixed cutter 11 and the movable cutters 13. A slide plate 19 holding the fixed cutter 11 and the movable cutters 13 of the cutter unit 10 is slidably supported by a base 20. The fixed cutter 11 and the movable cutters 13 of the cutter unit 10 can advance to the staple strike out portion constituting the operation region of the movable clincher 5 from an opening portion 8 (refer to Fig. 6) formed at the support plate 7 when the movable clincher 5 is pivoted to the standby position as shown by Fig. 9 and Fig. 10. Further, in pivoting the movable clincher 5, as shown by Fig. 11 and Fig. 12, the cutter unit 10 is removed from the operation region of the movable clincher. Thus, the movable clincher 5 and the cutter unit 10 are prevented from interfering with each other.

[0055] When the movable clincher 5 is pivoted to the standby position as shown by Fig. 3 and Fig. 4, as shown by Fig .9 and Fig. 10, the respective cutter edges 14, 15 of the fixed cutter 11 and the movable cutter 13 of the cutter unit penetrate the opening portion 8 formed at the support plate 7 to project to a front side. The cutter unit enters this area between the pair of movable clinchers 5 pivoted to the standby positions opposing the staple strike out portion. The front end portion of the staple leg S1 struck out from the staple strike out portion of the striking mechanism portion 3 and inserted into the stack of sheets being stapled is cut by the cutter unit 10, as shown by Fig. 11 and Fig. 12. The cutter unit 10 is moved from the operation region of the movable clincher between the movable clinchers 5, after which the movable clincher 5 is pivots to bend the staple leg S1 cut to the predetermined length along the back side of the stack of sheets being stapled to bind the stack.

[0056] Further, in order to prevent the staple chips cut by the cutter unit 10 from getting into the drive mechanism or a clearance of a part of the stapler to interfere with, e.g., the drive mechanism, the staple chips cut by the fixed cutter 11 and the movable cutter 13 of the cutter unit 10 are made to be dropped into a chute 17 formed on a side of a lower face of the cutter unit 10 by way of an opening 16 formed on a rear side of the cutter edge 15 of the fixed cutter 11. The staple chips are guided into a chip case 18 formed at a side face of the machine frame 2 by the chute 17 to be stored in the chip case 18.

[0057] The operation of the embodiment will be explained as follows. In an initial state, as shown by Fig. 1, the clincher mechanism portion 4 is arranged above the striking mechanism portion 3, and a gap is formed between the upper face of the striking mechanism portion 3 and the lower face of the clincher mechanism portion 4 to allow insertion of the stack of sheets to be stapled. Further, as shown by Fig. 4, the movable clincher 5 of the clincher mechanism portion 4 is pivoted to the standby position and the cutter unit 10 moved to the removed position shown in Fig. 11 and Fig. 12.

[0058] When the stack of sheets being stapled is arranged between the striking mechanism portion 3 and the clincher mechanism portion 4, as shown by Fig. 2, the clincher mechanism portion 4 moves in the direction of the striking mechanism portion 3 and the stack of sheets being stapled is pinched between the clincher mechanism portion 4 and the striking mechanism portion 3. Synchronously, the cutter unit 10 slides to the front side and the cutter edges 14, 15 of the fixed cutter 11 and the movable cutter 13 are arranged at positions opposed to the staple strike out portion of the striking mechanism portion 3 as shown by Fig. 8 and Fig. 9. Thereafter, the staple formed into the C-shape by the staple strike out mechanism of the striking mechanism portion 3 is inserted into the stack of sheets being stapled, and pinched between the striking mechanism portion 3 and the clincher mechanism portion 4. The pair of staple legs S1 now protrude from the back side of the stack of sheets being stapled and are arranged on both sides of the fixed cutter 11 arranged on the back side of the stack of sheets being stapled.

[0059] After the staple has been inserted into the stack of sheets being stapled, as shown by Fig. 8 and Fig. 13, the pair of movable cutters 13 of the cutter unit 10 pivot centering on the pivoting shafts 12. Thus, the front end portions of the staple legs S1 are cut by the cutter edges

14 of the movable cutters 13 and the cutter edges 15 of the fixed cutter 11. The fixed cutter 11 and the movable cutter 13 of the cutter unit 10 are arranged at a fixed distance from the upper face of the sheets to be bound and therefore, the length of the staple leg protruding from the stack of sheets being stapled after cutting the front end by the fixed cutter 11 and the movable cutter 13 is equal to that fixed distance. Further, at this occasion, an inner side face on a base side of the staple leg is supported by the cutter edge 15 of the fixed cutter 11, a portion of a front end side of the staple leg is moved from the outer side to the inner side by the cutter edge 14 of the movable cutter 13 and therefore, the burr formed at the cutting face of the staple leg is on the inner side of the staple leg S1, that is, the side of the stack of sheets being stapled.

[0060] After cutting the front end portion of the staple leg S1 with the cutter unit 10, as shown by Fig. 11 and Fig. 12, the cutter unit 10 moves from the position opposed to the staple strike out portion, that is, the operation region of the movable clincher 5. Thereby, the movable clincher 5 is made to be able to be pivoted, as shown by Fig. 5 and Fig. 6. The pivoting clincher 5 pivots centering on the pivoting shaft 6 and the staple legs cut by the predetermined length are bent along the upper face of the stack of sheets being stapled to thereby finish the staple binding operation.

[0061] Further, when the cutter unit 10 is arranged at the standby position shown in Fig. 11 and Fig. 12, the staple chips of the staple legs cut by the movable cutters 13 are dropped onto the chute 17 formed on the side of the lower face of the cutter unit 10 by way of the opening 16 formed on the rear side of the fixed cutter and the staple chips guided by the chute 17 are guided into and stored inside the chip case 18 formed at the side face of the machine frame 2.

[0062] As described above, the front end of the staple leg S1 is cut such that the length of the staple leg S1 after being cut by the cutter unit 10 always protrudes from the upper side of the stack of sheets being stapled by a fixed length and therefore, even when thin stacks of sheets to be stapled are bound, the front end of the staple leg S1 does not re-penetrate the stack of sheets to protrude from the lower side of the stack of sheets and a stable binding condition can be maintained. Further, the burr formed by the cutting face of the staple leg S1 is formed on the inner side of the staple leg S1, that is, to the side of the face of the stack of sheets being stapled and therefore, in the staple binding state, the stack of sheets is bound in a state in which the burr

at the front end face of the staple leg S1 is brought into close contact with the side of the rear face of the stack of sheets being stapled. Even when the hand is brought into contact with the staple leg S1 after binding the stack with the staple, the hand is not brought into contact with the burr and there is not a concern of being injured by the burr produced by cutting the staple leg S1.

[0063] Further, the cutter unit 10 is able to move between the position opposed to the staple strike out portion constituting the operation region to pivot the movable clincher 5 and the position removed from the operation region to pivot the movable clincher 5. The cutter unit 10 is made to advance to between the movable clinchers 5 pivoted to the removed position after cutting the staple leg. The cutter unit 10 is moved from between the movable clinchers 5, the cut staple leg is bent by the movable clincher 5 and therefore, the length of the portion of the movable clincher 5 engaged with the staple leg S1 can be large and the staple binding shape can be formed by engaging the movable clincher with the front end portion of the staple leg S1.

[0064] <Second exemplary embodiment>

[0065] Fig. 14 is a side view showing the stapler 101 embodying a staple leg chip processing apparatus according to a second exemplary embodiment of the invention. A machine frame 102 forming an outer contour of the stapler 101 contains an electric motor and a drive mechanism driven by the electric motor. Further, a lower portion of the machine frame 102 includes a striking mechanism portion 103 driven by the drive mechanism for striking out a staple formed in a C-shape to a stack of sheets being stapled. The striking mechanism portion 103 of the stapler 101 according to the embodiment supplies a number of staple members in a straight shape connected in series to each other to a staple strike out portion of the striking mechanism 103, forms the staple member supplied to the staple strike out portion into a C-shape by forming means, and strikes out the formed staple upwardly from a lower side to an upper side of the stack of sheets being stapled arranged on an upper side of the striking mechanism portion 103 by strike out means formed at the staple strike out portion. Further, an upper portion of the machine frame 102 opposed to the striking mechanism portion 103 is formed with the clincher mechanism portion 104 for bending staple legs protruding from an upper face of the stack of sheets being stapled.

[0066] The clincher mechanism portion 104 is pivotably supported by the machine frame 102. After arranging the stack of sheets being stapled between the striking mechanism portion 103 and the clincher mechanism portion 104, as shown by Fig. 15, the clincher mechanism portion 104 is pivots in a direction of the striking mechanism portion 103 to pinch the stack of sheets being stapled between the striking mechanism portion 103 and the clincher mechanism portion 104. At the clincher mechanism portion 104, as shown by Fig. 16, a pair of movable clinchers 105 engaged with legs of the staple S protruding from the upper face of the stack of sheets being stapled for bending the staple legs S1 pivot on pivoting shafts 106 relative to a support plate 107. By pivoting the movable clincher 105 from a standby position shown in Fig. 16 to an operating position shown in Fig. 17 centering on the pivoting shaft 106, the staple legs S1 protruding from the upper face of the stack of sheets being stapled are bent along the upper face of the stack of sheets being stapled.

[0067] Further, the clincher mechanism portion 104 is formed with the cutter unit 110 for cutting front end portions of the staple legs S1 such that the length of the legs protruding from the stack of sheets being stapled is made to be a constant length. As shown by Fig. 18, the cutter unit 110 is constituted by the fixed cutter member 111 in a plate-like shape a front end portion of which is formed with a cutter edge 112 arranged between the pair of staple legs S1 protruding from the stack of sheets being stapled the upper side of the stack of sheets being stapled, and a pair of movable cutters 114 pivotably supported centering on pivoting shafts 113 in a state of being brought into close contact with an upper side of the fixed cutter member 111 in the plate-like shape. Front ends of the pair of movable cutters 114 are formed with cutter edges 115 opposed to the cutter edges 112 of the fixed cutter member 111, with staple legs S1 arranged between the cutter edges 112, 115. By pivoting the movable cutter 114 centering on the pivoting shafts 113 such that the cutter edge 115 of the movable cutter 114 is moved from an outer side to an inner side direction of the staple leg S1, a front end portion of the staple leg S1 is cut to a predetermined length between the cutter edge 115 of the movable cutter 114 and the cutter edge 112 of the fixed cutter member 111.

[0068] The fixed cutter member 111 in the plate-like shape forming the cutter unit 110 is slidably supported by an upper face of the support base 116 formed on a rear side of the support plate 107 supporting the movable clincher 105. The cutter unit 110 is made to be able to move

such that portions of the cutter edges 112, 115 can advance from the striking mechanism portion 103 to a position corresponding to a staple strike out position. As shown by Fig. 16 and Fig. 18, when the movable clincher 105 is pivoted to the standby position, the cutter unit 110 is moved to the front side. The cutter edges 112, 115 of the fixed cutter member 111 and the movable cutter 114 are arranged to advance from an opening portion 108 formed at the support plate 107 to a staple strike out portion constituting an operation region to pivot the movable clincher 105, and the front end portions of the staple legs S1 struck out from the striking mechanism portion 103 and protruding from the stack of sheets being stapled are cut by rotating the movable cutter. Further, after cutting the staple leg S1, the cutter unit 110 is moved to the rear side to escape from the operation region of the movable clincher 105, thereby, staple binding is carried out by bending the staple leg S1 cut by the cutter unit 110 along the rear face of the sheets to be bound without interfering with the movable clincher 105 with the cutter unit 110.

[0069] The stapler 1 is formed with a staple chip processing apparatus 120 for preventing staple chips of the staple leg S1 produced when the staple leg S1 is cut by the cutter unit 110 from scattering into the stapler 101. As shown by Fig. 20, the staple chip processing apparatus 120 is constituted by the opening 121 formed at the fixed cutter member 111 in the plate-like shape formed with the cutter edge 112 at the front end portion to penetrate from an upper face side to a lower face side of the fixed cutter member 111, the opening 122 formed at the support base 116 for slidably supporting the fixed cutter member 111 to penetrate from an upper face side to a lower face side of the support base 116, the cutting chip containing portion 123 formed at the side face of the machine frame 102, and the chute 124 one end side (first end portion) of which is arranged on the lower face side of the support base 116 to be continuous with the opening 122 formed at the support base 116 and other end side (second end portion) is arranged inside of the cutting chip containing portion 123.

[0070] The opening 121 formed at the fixed cutter member 111 and the opening 122 formed at the support base 116 are respectively formed at positions at which the two openings 121, 122 are matched when the cutter unit 110 is made to move to the rear position. When the cutter unit 110 is arranged to the position, the staple chip cut by the cutter unit 110 is dropped to discharge to a lower face side of the support base 116 by way of the two openings 121, 122, and discharged to the staple chip containing portion 123 by way of the chute 124 arranged continuously to the

lower face side of the opening 122 of the support base 116. When the cutter unit 110 is made to move to a staple strike out position on a front side for cutting the staple leg, the two openings 121, 122 are arranged at positions shifted from each other, and the cutting chip is contained inside of the opening 121 formed at the upper face of the fixed cutter member 111 or the fixed cutter member 111.

[0071] The chute 124 arranged on the lower face of the support base 116 is constituted by a first chute 125 mounted to the back face of the support base 116 to cover a lower face side of the opening 122 formed at the support base 116, and a second chute 126 one end side of which is pivotably supported by a portion of a discharge port 125a of the first chute 125 and other end side of which is arranged inside the staple chip containing portion 123 formed at the side face of the machine frame 102 of the stapler 101. The staple chip are discharged into the staple chip containing portion 123 by making an inclination angle of the second chute 126 large by pivoting a side of a pivotably supporting portion 127 of the second chute 126 in an upper direction by operating the clincher mechanism portion 104 in a direction of being separated from the striking mechanism portion 103.

[0072] A lower portion of the staple chip containing portion 123 is formed with an opening 128 inclined by an angle of approximately 45 degrees for discharging the cutting chip stored inside of the staple chip containing portion 123 from inside of the staple chip containing portion 123. The opening 128 is mounted with a lid member 129 for closing the opening 128 at normal times. An inner wall face 123a contiguous to the opening 128 of the cutting chip containing portion 123 is formed by a vertical or horizontal wall face to be able to prevent a situation when the cutting chip inside of the cutting chip containing portion 123 is discharged, the cutting chip stays at the inner wall face of the cutting chip containing portion 123 or an edge portion of the opening 128, the cutting chip is pinched between the lid member 129 and the edge of the opening, the lid member 129 is not completely closed and the cutting chip runs out therefrom.

[0073] Further, as shown by Fig. 16, a cover 130 is mounted to cover the respective cutter edges 112, 115 of the fixed cutter member 111 and the movable cutter 114 and an upper portion of the opening 121 formed at the fixed cutter member 111. The staple chips cut by the fixed cutter member 111 and the movable cutter 114 are prevented from being scattered and even

when the stapler 101 is arranged in a vertical direction to close a lower end portion of the sheet arranged in the vertical direction, staple chips are guided to the opening 121 formed at the fixed cutter member 111 by the cover 130. Further, as shown by Fig. 22, an inclined face 121a is formed at an edge on a front side proximate to the cutter edge 112 of the opening 121 formed at the fixed cutter member 121, and by the inclined face 121a. The staple chips cut by the cutter edges 112, 115 of the fixed cutter member 111 and the movable cutter 114 are guided into the opening 121 and are guided to the chute 124 by way of the opening 122 formed at the support base 116.

[0074] An explanation will be given of operation of the staple chip processing apparatus 120 according to the second embodiment as follows. In an initial state, as shown by Fig. 14, the clincher mechanism portion 104 is arranged in a state of being operated to an upper side relative to the striking mechanism portion 103, and a gap is formed between the upper face of the striking mechanism portion 103 and the lower face of the clincher mechanism portion 104 to be allow insertion of the stack of sheets being stapled. Further, as shown by Fig. 16, the movable clincher 105 of the clincher mechanism portion 104 pivots to the standby position, and as shown by Fig. 19, Fig. 23 and Fig. 24, the cutter unit 110 is operated to slide to the removed position on the rear side in a state of opening the cutter edge 115 formed at the front end of the movable cutter 114.

[0075] When the stack of sheets being stapled is arranged between the striking mechanism portion 103 and the clincher mechanism portion 104, as shown by Fig. 15, the clincher mechanism portion 104 is operated in the direction of the striking mechanism portion 103 to pinch the stack of sheets being stapled between the clincher mechanism portion 104 and the striking mechanism portion 103. Synchronously, as shown by Fig. 18, the cutter unit 110 is made to move to the front side, and the respective cutter edges 112, 115 of the fixed cutter member 111 and the movable cutters 114 are arranged at positions opposed to the staple strike out portion of the striking mechanism portion 103. At the same time, the cutter edges 115 of the movable cutters 114 remain open. Thereafter, the staple S formed in the C-shape by the striking mechanism portion 103 is struck to the stack of sheets being stapled pinched between the striking mechanism portion 103 and the clincher mechanism portion 104. The pair of staple legs S1 protrude from the stack of sheets being stapled and are arranged on both sides of the cutter edges

112 formed at the front end portion of the fixed cutter member 111 arranged on the upper face side of the stack of sheets being stapled.

[0076] After the staple S has been inserted into stack of sheets being stapled by the striking mechanism portion 103, as shown by Fig. 21, the pair of movable cutters 114 of the cutter unit 110 pivot centering on the pivoting shafts 113. Thereby, the cutter edges 115 formed at front ends of the pair of movable cutters 114 move toward each other, and front end portions of the staple legs S1 are cut by the cutter edges 115 of the movable cutters 114 and the cutter edges 112 of the fixed cutter member 111. In a state in which the cutter edges 112, 115 of the cutter unit 110 advance to the staple strike out portion as described above, as shown by Fig. 22, the opening 121 formed at the fixed cutter member 111 and the opening 122 formed at the support base 116 are arranged at positions shifted from each other and therefore, the staple chips are guided by the inclined face 121a formed at the front edge of the opening 121 of the fixed cutter member 111 and is guided to inside of the opening 121 formed at the fixed cutter member 111.

[0077] After the front end portions of the staple legs are cut by the cutter unit 110, the cutter unit 110 is moves to the rear side from the position opposed to the staple strike out portion, that is, the operation region of the movable clincher 105 as shown by Fig. 19 and Fig. 23. Thereby, the movable clincher 105 is made to be able to be pivoted, as shown by Fig. 17. The pivoting clincher 105 pivots on the pivoting shaft 106. The staple legs cut to the predetermined length are bent along the upper face of the stack of sheets being stapled to thereby finish the series of staple binding operations. The movable cutters 114 pivot away from each other on the pivoting shafts 113 after moving the cutter unit 110 to the removed position on the rear side shown in Fig. 19 and Fig. 23.

[0078] When the cutter unit 110 is moved to the removed position on the rear side, as shown by Fig. 24, there is brought about a state in which the opening 121 formed at the fixed cutter member 111 and the opening 122 formed at the support base 116 coincide with each other. The staple chips guided into the opening 121 of the fixed cutter member 111 are dropped onto the second chute 126 by way of the opening 122 of the support base 116 and by way of the first chute 125 mounted to the lower face side of the support base 116. Synchronously with returning the cutter unit 110 to the standby position on the rear side, the clincher mechanism portion 104

which has clinched the staple leg S1 pivots to the upper side to be separated from the striking mechanism portion 103. By pivoting the clincher mechanism portion 104, the pivotable supporting portion 127 of the second chute 126 is moved to the upper side to pivot to increase the inclination angle of the second chute 126 and the cutting chip dropped to the second chute 126 is discharged to the cutting chip containing portion 123.

[0079] As described above, the staple chips cut by the fixed cutter member 111 and the movable cutter 114 of the cutter unit 110 are dropped onto the chute 124 formed on the lower face side of the support base 116 by way of the opening 121 formed on the rear side of the cutter edge 112 of the fixed cutter member 111 and the opening 122 formed at the support base 116 slidably supporting the cutter unit 110. The staple chips are guided into the staple chip containing portion 123 formed at the side face of the machine frame 102 by the chute 124 to be stored in the chip containing portion 123. This prevents the staple chips of the staple legs cut by the cutter unit 110 from advancing to the drive mechanism and the clearances around the moving parts of the stapler 101 to damage the drive mechanism or other parts of the stapler 101.

[0080] Industrial Applicability:

[0081] The stapler of the invention is provided with the cutter unit comprising the fixed cutter arranged between the staple legs and the pair of movable cutters formed with the cutter edges operated from the outer side to the inner side of the staple legs relative to the fixed cutter. The cutter unit is arranged slidably between the position advanced into the operation region of the movable clincher opposed to the staple strike out portion of the striking mechanism and the position removed from the operation region of the movable clincher. The staple clinch shape can be provided by the movable clincher. Further, the chances of being injured by the burr formed at the front face of the staple leg are greatly reduced.

[0082] Further, the stapler of the invention is constituted such that the cutter unit for cutting the staple leg is arranged slidably between the staple strike out position and the removed position on the rear side of the position. After arranging the cutter unit at the staple strike out position to cut the staple leg, the cutter unit is moved to the removed position on the rear side and at the position, the staple chips are discharged to the rear face side of the cutter unit. The staple chips are guided to the chip containing portion by the chute and therefore, the stapler can be installed

in directions capable of binding the stack of sheets being stapled arranged in either of the horizontal direction or the vertical direction, and the staple chips of the staple leg can firmly be guided to the chip containing portion.